

FAITH, SCIENCE, RELIGION IN POST-MODERN CULTURE ¹

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The problem today

Today the old problem of the relationship between science and religion is becoming involved in such new situations as to request a radically different approach. However, not so many people seem to realize this fully, ignoring precious and important instruments for their research and for a renewed systematization of this topic². It is therefore in the interest of everyone to analyse and to master these elements. As it is impossible to explain the whole matter in a short relation, I shall present only the essential data and refer to further documentation and bibliography³. The ways of approaching this subject can be grouped around a few fundamental points: a) contents of research; b) principles and methods of research; c) human behaviour, attitudes and responsibility of researchers⁴.

Let us look at them more closely. The first approach, considered the most ancient and traditional, consists in comparing both scientific and religious contents directly and immediately. This is a rather imperfect and incorrect method because it considers and deals with non-homogeneous and also very different realities. In this way it is easy to find a concordance or a discordance or even an opposition where they do not really exist. It was and is still being used by some very convinced believers working in the scientific field or well versed in natural science. It is also preferred by some very convinced no believers and "*old style*" natural scientists who consider their assertions as being absolutely capable of directly expressing the investigated reality.

On the contrary, it is much less popular among younger believers, researchers and experts in science, or among persons having problems of faith but open to further reflection. Today it takes two different aspects which we will analyze in the next paragraph. A second approach, much more aware of epistemological problems, is focused on the foundations, methods and procedures of research. As a means of dialogue or debate, it is still in its beginnings but it already appears very promising. It is, in fact, capable of a rigorous use of the enormous patrimony of thought, not only **of science** but, above all, **about science**. It draws on the huge accumulation of historical-critical, systematic and methodological research and reflection on science and **scientific thought**. These two are not exactly the same.

Several approaches

This approach is particularly difficult and needs notable epistemological, philosophical and scientific preparation and interdisciplinary awareness, because it embraces a great quantity of multidisciplinary information. As a consequence, it demands structures and institutions for an encounter and a dialogue between theologians, scientists and philosophers, that must be organized from scratch. This approach is preferred by those involved in various disciplines who possess an epistemological and philosophical competence. It also needs people particularly skilled in teamwork and open to transdisciplinare dialogue⁵. A third approach analyzes the activity and behaviour of researchers, and pays particular attention and sensitivity to the psychological and human condition of research, in order to illuminate the humanistic and personal background of scientific experience.

This approach is developed in two complementary ways: a) the comparison between the attitudes of both scientific researchers and religious people or believers; b) a reflection on the deep human attitudes involved in the scientific research in view of the foundation of a scientific humanism both in culture and in society⁶. Each one of these approaches obeys its own logic, methods, rules and principles. However, all of them share the common goal and intention of making a good use of the results of scientific research in order to transform science and technology into instruments for the development of true human, social and cultural values and to make scientific results an occasion of constructive integration for our life instead of a hindrance or

motive of discord, conflict or moral decline⁷. Therefore we must begin to consider the relationship between science, faith and religion within a much larger and important frame of reference and in a richer and more articulated cultural way. We'll proceed, now, to consider the first approach or the "comparative" one.

The "direct comparison" between scientific and religious contents

The significance of the word "direct" will be better understood after reading also the next paragraph. Here the adjective indicates, above all, a comparison between statements which are not placed back in their wider historical, epistemological, linguistic and cultural context in which they were formulated. On the contrary, they are considered separately from it and rather more dependent on the presentation of popularizers than on the much more reliable description of rigorous thinkers and serious researchers. Such methodology has a long tradition and is still followed by many respectable authors. We will see, further on, how this procedure is strongly controversial⁸. At present it is presented in two different forms. The first one lays stress on the limits of science in front of problems posed by scientific research but not resolvable by it because they are *ultra* or *meta* scientific (that is at the extreme limits of science or even beyond it). The second one prefers to analyze the inherent difficulties of research which do not rise at its extreme limits, but at its very centre, as a normal and habitual fact⁹. Let us look at the first.

The impassable limits of science

The presuppositions of this method have been presented by the physician Borghi, for whom the intrinsic development of science, since the last century, would have progressively demolished the then intangible dogmas of scientism, positivism and materialism, and peremptorily reposed those questions which they were claiming to put aside. It is the merit of physics, astronomy and other natural sciences, strengthened by a growing documentation on the universe and its fundamental phenomena, to have reposed, in all their vastness and depth, the problems once believed to be exclusive domain of philosophy, metaphysics and religion. This innovation is caused by the fact that, after the advent of science, such problems, even if rigorously philosophical and religious, have their origins and foundations within the sciences themselves. They go further, however, insofar as science cannot solve them. For this reason, some scientists call them *religious* while the more accurate and appropriate term would be *philosophic* or even *philosophic-religious*.

The demonstration of the origin and of the scientific relevance of these problems is due to modern sciences and to the very important process of a "**unified understanding of nature**" which they introduced. This process made it possible to observe an extraordinary quantity of natural phenomena, to know details and information about them, to represent them in *quantitative-mathematical* and *logical-rational* ways, and to gather them all in a system without gaps or contradictions and cemented by a general common logic¹⁰. As a consequence, scientists assumed that, sooner or later, all reality would be given a common explanation and inserted in a general organic view. In epistemological terms that view was linked with a theory defined as the "*theory of organic accumulation of scientific knowledge*", at present strongly criticized and rejected¹¹. Such understanding of nature assumes that everything is based on a "*casual sequence of events*", characterized not only by the fact that a particular event always comes after another, but also that both represent, together, different ways of distributing an equal *quantity* of a specified nature¹².

The Universe and the explanatory systems

Consequently, global scientific understanding of the universe would consist of: a) the description of all phenomena as casual sequences; b) the supposition that these sequences are mutually connected by natural laws, *each and all together* compulsory and necessary¹³. From the time of Galilei the belief that all sequences of physical events can be described in time and space through the observation of the following measurable constants: **mass, energy, electric potential, quantity of motion, angular moment** has become stronger and stronger¹⁴. However, in the

logical-experimental method, experience can only acknowledge the existence of things considered theoretically possible, while logic can only explain things that observation has proved as existent. Yet there is no reason why the value of the *five constants (or five variables)* is actually that which we observe and not another. We can only observe and accept those values without being able to prove or scientifically explain why they are just those and not other ones¹⁵.

This is a very serious shortcoming, but above all an insurmountable limit of scientific knowledge. The fact that science is forced to admit that, from its point of view, the value of the *five constants* is arbitrary, indicates one of its insuperable limits. One must therefore admit that the universe, as seen nowadays in its values, is not obligatory, but appears as the consequence of a choice. To this, one must add the certainty that it has had a beginning, and will quite probably have an end, because it operates like a gigantic thermal machine based on the second thermodynamic principle (entropy). To take into account the problem of its beginning is not an act of unjustified fantasy. It is something more. Strictly speaking, science demands that the cause of the universe be not of the same type as the five observed known forces. The problem is under rigorous consideration even if its solution is beyond the reach of science inasmuch as nature cannot be the cause of itself. It could be illuminating to remember here the biology Nobel Prize F. Jacob's favourite statement: "*locked within its explanatory system, science cannot get out*"¹⁶.

Science and its unsolvable problems

Science proposes, demonstrates and proves problems decisive and extremely significant both for science and culture, which, however, it cannot solve by using its criteria, methods and instruments. This unquestionable fact rectifies some uncontrolled presuppositions and inveterate dogmas of "*scientism*" which were at the root of the old science-faith conflicts for a long time¹⁷. The history of scientific thought, reveals that, in fact, the great initial success of natural sciences had generated in researchers the illusion that all that exists in the universe could eventually find complete explanation and perfect logical setting only within science¹⁸. This idea, devoid of any scientific-philosophical foundation or factual proof, became a widespread belief, a fundamental attitude, a faith, an ethical postulate. Theoretically it was expressed in the classical canons of scientism: a) everything, absolutely everything can be explained in scientific terms; b) what cannot be explained scientifically is absurd or impossible.

As a mere operative criteria of demarcation, used to define the methodological precincts of science, they were in part acceptable, but applied dogmatically as metaphysical criteria they turned out to be unacceptable not only for human thought and culture but also for science itself¹⁹. They were shown to be based on a basic prejudice: that the limited and partial logic of any science, useful only within its very narrow and rigorous limits, should express the total logic of the universe. Only the methodological and epistemological immaturity of the research, and the small number of disciplines at that time, could account for such a bad misunderstanding. Consequently, it encouraged the ideology of scientism based on "*half truths*", on unproved hypotheses and philosophical gratuitousness, which was to condition the results of research for such a long time²⁰. On the ground of that ideology, materialism and positivism could claim that all that could not be set within the logic of scientism - prevailing at that time - was absurd, senseless, unproposable. These prejudices caused great damage, not so much to the science-faith dialogue as to the progress of research itself.

It is only thanks to the "*great crisis*" of physics, between the end of the last century and the middle of ours, that the scientific field discarded them²¹. We should not underestimate the fact, among many others, that on the basis of such dogmas even Max Planck's quantum theory was judged to be stupid, and this costed its inventor, one of the greatest geniuses of all time, a painful and humiliating ostracism from the official and academic scientific world of the time. Another dogma of scientism, later termed *physicism*, or *physicalism*, claimed that everything was to be explained in terms of mechanistic and deterministic physical laws, at that time considered fundamental for the whole reality. This causes notable difficulties and delays for the development of biological, human and social sciences. It is to be noted that it was not scientific knowledge

which created these problems but the pseudo-philosophical prejudices enclosing it and lurking within the researchers. Only the progressive accumulation of increasing contradictions led to the confutation of such ideological dogmas.

The "*ultimate causes*" of the universe

Successively it was possible to accept the idea that the approach of every science and of the various forms of knowledge requires the use of multiple kinds of logic, equally legitimate even if not interchangeable nor reconcilable²². The critical revision could not stop here. Also Leibniz's principle that everything can be scientifically rationalized, revealed its extreme limit: all things can be rationalized but not their existence. Actually, the sciences experience every day that many things, logically possible, in fact do not exist, and do not happen²³. Consequently, researchers cannot explain existence with their logic, but like any other ordinary person, they can simply recognize it by observation. Moreover, having recognized existence, they cannot scientifically demonstrate the cause of the whole. Therefore, science finds itself prisoner of its own assumptions, which, while enabling it to raise important and decisive problems, prevent it from solving them.

Nowadays it is clear that sciences carry out the important function of putting man in contact with realities whose existence, internal logic and rationality they assert, together with the necessity of an adequate cause. But, at the same time they are not able to state what this cause is because it totally exceeds their narrow sphere of enquiry²⁴. This fact is made even more significant than in former times, because today we can make use of a rigorously scientific formulation of "*physical cause*", which, as seen by Galilei and ever since, describes and measures all the sequences of physical events in time and space using the five aforementioned constants²⁵. Thus the sciences find themselves today placed between two very clear boundaries: a) the unproved and unprovable assumptions on which they are based; b) the problems they arouse and cannot solve. These problems concern, above all, the "*ultimate causes*" of the universe, if we want to use scientific words, or its "*origins*" if we want to use philosophical or religious terms.

Reality, however, does not change. Nor do such problems stop here. We can point out many, for instance, the ones relating to: 1) Any type of existence as such. 2) The existence of the universe as it is presented to us by the natural sciences. 3) The existence of life as presented to us by biological sciences. 4) The existence of the "*Ego*", the person and the personality as presented to us by philosophical and social sciences. 5) The liberty inside the physical world, represented by the individual "*ego*" in opposition to the determinism of the physical universe. 6) The existence of disharmony and dualism involving questions of pain, suffering and disorder, as presented to us by anthropological and medical sciences. This should suffice regarding the problems rising at the extreme limits of research. Let us proceed now to the second type of direct confrontation which refers to the habitual problems rising not at the extreme limits of research, but emerging at its very centre²⁶.

Problems and difficulties in scientific research

We find a clear description of these problems and difficulties in other physicists who follow a way that differs from the previous ones²⁷. They underline, in fact, epistemological aspects which will be further explained in the next paragraph. They say that the sciences, refining methods and instruments to penetrate the two extremes of micro and macrocosm, from the infinitely small elementary particles to the infinitely huge astronomical vastness - considered to be the inner roots and the extreme ramifications of being - have seen the comfortable solidity and clarity characterizing the common experience of things fade away²⁸. In the infinitely small they have come up against bafflingly darting particles and rebellious waves thwarting all attempts at a precise focusing of their elusive identity.

At the opposite extreme, in front of the endless vastness of the universe, undermined by a precipitous expansion, this same material immensity disappears as if destined to fade to nothing²⁹. Such facts have led them to state that: 1) These realities confirm the Christian doctrine of a

contingent world ontologically instable and therefore created from nothing. Further confirmation would be found in the latest theories on the opposite symmetrical entities of particles and antiparticles, matter and antimatter, etc. 2) At the level of subatomic research, beyond the limits of sensible knowledge, it is necessary to resort to an inner more immaterial interpretation where the *metaphysical* replaces the *physical*. Therefore the ideology of scientism which pretended to reach the "*pillars of the universe*", must admit that their nature is no longer physical but metaphysical, and that such a statement is based on the data of current observation in physics.

This seems to agree with W. Heisenberg's fundamental opinion that the common language, in spite of its apparent vagueness, is more stable than the sophisticated and idealized scientific language, which ends by losing contact with reality. The cosmologist Mc Crea confirms that, when observing the distant regions of the universe, we obtain more and more uncertain information on its original stages, and therefore we must depend more and more on rational deduction to complete what we cannot gather by observation and experimentation³⁰. This overturns another basic principle of the ideology of scientism. Even the previsions of "*scientistic agnosticism*" which declared much of reality to be unknowable, have been proved wrong by the development of science.

Possibility of knowing and understanding creation

Such "*impossibility to know*" was for a long time the spearhead of a certain agnostic antireligiosity. It has come about, instead, that, for example, the "*impassable limit of visibility*" of optical microscopes have been surpassed by electronic and protonic microscopes. The "*impossibility to know the composition of celestial bodies*" proclaimed by A. Comte has been disproved by the spectroscope, and so on. Far from endorsing the resigned surrender of a God-less science, as proclaimed by Spencer in his "*ignorabimus*", the modern sciences confirm the possibility of knowing and understanding "*creation*", as was always upheld by Christian thought.

As a matter of fact, the verification of numerically well-defined physical constants (action, gravitation, elementary electric charge, speed of light, etc), that of universal laws and principles (such as gravitation, conservation of matter, of energy and electricity, and degradation of energy), as well as the great unitary theories (Maxwell's for electromagnetism, those of kinetic energy, of thermodynamic behaviour of matter, of chemistry from Mendeleeff to nuclear physics, etc.), converge toward a unitary cosmology, that of "*big bang*" (or huge initial explosion), that is to say of a beginning³¹. In its turn, the theory of evolution unifies an immense quantity of data in a grandiose plan which presents the biological world as moved from the inside. All this leads to the idea of a far reaching design, and though we still ignore its goals and a large part of its mechanism, we cannot deny the inner vastness of its "*programming*", wonderfully condensed in the heart of a cell, in the genetic code of every living being³².

Even in mathematics a great unification is in progress, and in a single formula we see contained infinite geometric and hyper geometric figures, from the simplest to the most complex, a clear example of how a single concept, simple and unitary, can summarize an infinite multitude of extremely different entities. This suggests to many thinkers an analogy with divine thought, capable of embracing, in a most simple and unitary act, the totality of the existent and of the possible³³. Another significant example is given by apparently contradictory realities: mass-energy, space-time in relativity, corpuscle-wave in elementary particles, which are found to be reconciled in the synthesis of a superior order. And finally it appears clearly that neither the field of mathematical forms, nor that of sensible realities could reach unity, completeness and significance without a hidden background inaccessible to the senses. Mathematics itself should be unthinkable without such elements transcending the senses as improper and imaginary points³⁴.

A brief summary of the "first approach"

We will close this review, which could continue at great length, summarizing as follows what modern research has proved: 1) Sciences present a number of decisive problems that do not find purely scientific explanations. 2) At their interior, sciences discover facts which transcend

their possibility of interpretation. 3) Both problems and facts necessitate more complex and global methods of thought to be adequately explained. 4) Many of the elements emerging from research constitute points of reflection and analogy of great interest for religious thought, faith and theology. This is, in synthesis, what we can gather by examining the main ideas of the followers of the first approach. However, we cannot forget that this method of "*direct confrontation*" between science and faith presents some problems as well³⁵.

The first is that some scientific discoveries, as considered in this way and as commonly presented, create difficulties to certain ways of understanding one's own faith or of expressing it. The second is that some data, experiences, and facts positively interpreted by believers, often receive negative interpretation by non-believers. The result is that the same scientific acquisitions can give rise to opposite interpretations. This fact opens the important questions of how such opposed interpretations of an identical reality can be possible, and whether we can or not establish more rigorous criteria to avoid or to resolve such contradictions. These are not only important but also fundamental questions which the first approach seems to ignore or, at least, to leave unsolved. Nevertheless they should find an answer.

For this reason both believers and researchers are looking for another approach, which we call the "*second approach*" which is more recent and profoundly different³⁶. It differs from the first one for its much greater attention to epistemological, methodological, linguistic, cultural and philosophical aspects of the problem emerging in contemporary thought. Such elements are not completely lacking in the first approach, so far analyzed, but they are not systematically developed nor explicitly utilized. Its careful examination of the "*thought of the sciences*" is not supplemented with an adequate development of the "*thought on the sciences*", which constitutes the most significant fact of present-day culture³⁷. This is very present in the second approach because it is capable of overturning many of the traditional convictions on the subject. So that we call it the "*critical-epistemological dialogue*" between science, faith and religion.

Epistemology and history of science in the science-faith dialogue

In order to appreciate the notable potentiality of the "*second approach*" a brief introduction is necessary. In fact, the direct confrontation on science-faith data implies a conception of science as *systematic knowledge, exact, objective, neutral, capable of progressive organic accumulation and of rigorous, verification of all its hypotheses*. One must bear in mind all these terms because they have been thoroughly investigated and proved to be inconsistent. Present-day epistemology wavers in declaring the deceptiveness or even the falseness of such prerequisites³⁸. This has been the result of an ample debate over the last centuries, due to the insurmountable difficulties that the classical conception of science met during its development. Serious criticisms were expressed on a double front: *internally*, by the keenest and most sensitive scientists; *externally*, by methodologists, epistemologists, philosophers and historians of science and of scientific thought³⁹.

A full list of names is impossible, as they are too many; we can only mention the most known such as Boutroux, Mach, Aviares, Le Roy, Duhem, Poi care, Brunching, Bachelard, Carnap, Neurath, Russell, White head, Wittgenstein, Piaget, and the contemporaries: Popper, Kuhn, Hempel, Lakatos, Feyerabend. Among scientists we mention Einstein, Planck, Bohr, Heisenberg, Piaget, Jacob, etc. These are only a tip of the immense iceberg of the *thought on the sciences* which will require arduous and long research work and reflection. They belong to the most different scientific and philosophic schools of thought; their reasoning tends to shed light on the real nature of the sciences, on their foundations, premises, methods, contents and characteristics such as objectivity, rigour, neutrality, reliability, etc. Owing to the vastness of the subject, we can only examine the essential conclusions, referring to the footnotes for documentation. A systematic analysis and demonstration of the matter can be found in our "*Criticism and Ethics in Scientific research*", in "*Faith and Scientific Reason*" and in "*Scientific Humanism and Christian Thought*"⁴⁰.

The conclusion there reached could be summed up in the following way: 1) Scientific statements are not objective expressions of reality, but extremely complex linguistic systems which require rigorous interpretation. They also contain ideological elements from which they cannot free themselves, and in their turn cause ideological thought. This depends on the partial, unilateral and provisional character of scientific knowledge. 2) Scientific propositions are not significant and appropriate anyway, always and everywhere, but only when in their narrow relation to the cultural, linguistic and social context in which they were formulated and expressed. Outside this very limited and precise context they are ambiguous, not correct nor clearly comprehensible. 3) Scientific knowledge is expressed through theories, symbols and myths, which condition its meaning, and require adequate interpretation. This fact strongly limits its alleged capacity of representing reality. Such descriptions represent "*caricatures*" and not "*photographs*" of reality.

This is not said in a disparaging sense, but to remember that they must emphasize only certain aspects to the detriment of others. 4) Science raises incessant questions which it cannot resolve by its own explanatory method. It constitutes its own self-imposed *impassable boundary* which it cannot impose upon other forms of research and human knowledge. Consequently, "*scientific*" is not a privilege, but a strongly restrictive criterion for science only. 5) The sciences start from multiple assumptions - philosophical, heuristic, logical, epistemological, hermeneutical, methodological - which they cannot verify and which condition the value of their assertions. The fundamental verification of them lies only within the province of philosophy and epistemology. 6) Scientific research is conditioned by the various social situations in which it takes place. Every human, cultural, social, political and economic factor influences it. 7) Scientific assertions are subject to specialist fragmentation which requires rigorous delimitations and is the cause of one-sidedness and partiality. 8) Research and experimentation are strongly limited by the current conditions of technology, which frequently impose numerous experimental makeshifts later to be interpreted accurately.

The thought of main epistemologists

After having presented these general characteristics, we must proceed to consider the fundamental problems pointed out by some of the most important modern and contemporary epistemologists. **Kuhn** has proved the impossibility of any organic and well ordered accumulation of scientific knowledge. Research reaches results progressively contradictory to its current *paradigms* (theoretical schemata) which end reversed and revolutionized. Consequently, the only hypothetical accumulation is that of the progressively insurmountable contradictions, which require a totally new basis for research⁴¹. **Wittgenstein** had anticipated the same idea by comparing the accumulation process to a city in disordered growth, with the new suburbs surrounding the old ones. Kuhn has preferred the image of a tumble-down shack with its still-standing walls threatened by those which are falling⁴².

Popper insisted on the fundamental temporariness of each acquisition, which can never be definitely shown to be true (*verified*), but only false (*falsified*). The sciences, therefore, do not obey the logic of truth but of error. Consequently, their dominant characters are conjecturalness, provisionality, partiality and temporariness⁴³. **Lakatos**, guessing the shattering consequences of these statements, tried to propose his theory of the "*programmes of research*" so as to lessen the total precariousness of theories and to let those which had been confuted live a little longer⁴⁴. **Feyerabend**, moreover, demonstrated the fragility of such an attempt and confirmed that scientific contents are a growing wave of reciprocally incompatible alternatives, and that rigour of methods is illusory, and impedes a good research. Finally he concluded that, only if man is allowed to operate with his open senses and free intelligence, drawing on all cultural sources - including metaphysics and religion - might valid discoveries still be possible⁴⁵.

Rigour in science

One of the major debates in progress concerns the rigour and objectivity of the sciences. Rigour refers to two aspects: a) the mathematical-logical aspect of theories; b) the empirical-

experimental aspect of the procedures of verification. The study of the first has given very surprising results. It has shown that the rigour of formal sciences, such as logic and mathematics, only concerns the consistency of and the respect for the procedures used to arrive at certain conclusions from certain premises, but it cannot be applied to the second. There is, consequently, a chain of unprovable premises including the fundamental axioms on which the whole construction of research is based. So that *we have splendid constructions on unverified and unverifiable bases*. Everything is accepted out of conviction or personal decision, nothing more⁴⁶.

Scientific rigour only ensures the exactness of procedures, not of premises, which remain undemonstrated and uncontrolled; so that it is reduced to mere "*formal correctness*". As to the second aspect of rigour, the difficulties concern the verifying of the facts. But here comes another problem: what is a fact? This seemingly naive question is the most difficult indeed, so much so that it has so far received no credible answer. It has only been possible to ascertain that "*pure facts*" are anything but pure, as they result from an extremely complex mixture of perceptions, system of psycho-physical sensations, and very elaborate conceptual constructions. What for some is a *fact*, for others is already *interpretation*.

The history of sciences demonstrates that much time and interminable discussion is often needed before reaching a satisfactory, even if always precarious, agreement⁴⁷. But even when this obstacle has been surmounted, the basic difficulty remains that verifications founded on facts never allow certainties because: a) contradictory facts capable of belying the preceding ones could always occur; b) the truthfulness of a theory can never be maintained on the grounds of its true consequences⁴⁸. In fact, the history of scientific discoveries has already unequivocally shown that one can habitually arrive at valid consequences from absolutely false theories. This has happened repeatedly in the major discoveries from Copernico and Galilei to Einstein⁴⁹.

Objectivity in science

Very often only after a very long time and owing to mostly accidental circumstances, can the false premises of theories be discovered. Since these points concern the fundamental verification of the sciences, it follows that sciences are always controvertible, confutable and hypothetical. Things do not improve in the case of "*objectivity*", contrived as a substitute for veracity demonstrated to be untenable. It was hoped that, even if not truthful, science could be at least objective. Objective proof should consist of experiences which can be repeated by several experimenters. The history of science shows that such comparison is bristling with difficulties and causes inevitable disputes. As a matter of fact, the confrontation is only between different people and communities, with all the sequences of personal and social prejudices, choices, opinions, evaluation, conflicts of interest and power, etc.

Therefore the so called objectivity is rather a question of inter-subjective confrontation of a situation giving place to very different interpretations⁵⁰. The only agreement is on excluding that objectivity could express a comparison between theory and reality, as traditional science once maintained. In the best of cases a comparison there could be only among theories of different schools. Unfortunately, there are good reasons to fear that it could consist, above all, of a competition between different institutions, determined by conflicting financial, economic or political interests considerably darkening its purity. It could also consist of an agreement often only reached by a majority⁵¹. In any case it is never an agreement on facts, but on conjectural descriptions of the reality, and it merely points out that such description could contain only a smaller number of defects.

On this matter, Einstein noted that science is not the soup, but only a "*description of the soup*", never to be confused with the reality which it intends to represent. Recapitulating: the objectivity of natural sciences is only an agreement, on descriptions which should allow well-defined standardizable operations, reached by majority, from some individuals. Human scientists, however, inverted this formulation, shifting the problem of objectivity from the end to the beginning. In fact, realizing that the final results of all research depend on the initial premises,

they have proposed to consider as objectivity only the previous, clear and open manifestation of the premises, in order to avoid the endless and often inconclusive final disputes. Control, therefore, must be made possible from the very beginning, and verification consists in a public debate on the premises⁵². Thus objectivity today appears as something oscillating between the inter-subjective discussion on results and that on premises or on both of them.

Neutrality of science

The preceding conclusions introduce the subject of freedom from any unproven presupposition. Today it is evident that science is one of the many activities overwhelmed by conflicts of power and of interests. Nothing in it is neutral⁵³. *Terminologies and languages* are not neutral as they depend on very different meanings and uses and call for acrobatic adaptations which, though giving them precision, cause them to lose concreteness and immediacy, making them sterile or meaningless. In any way they change the initial meaning of the common usage⁵⁴. *Material instruments* are not neutral as they depend on the general technological conditions. *Theoretic and logical instruments* are not neutral as they derive from the current philosophical and cultural models. *General premises and problems* affecting the formulation of research itself are not neutral either. Science is not neutral in respect of the more general assumptions of the diverse philosophical systems which openly or hidden condition it.

It could be enough, for instance, to remember the great difference between positivism and idealism, materialism and spiritualism, structuralism and functionalism, realism and conventionalism, physicalism and holism, determinism-mechanism and indeterminism, etc.⁵⁵ The history of scientific thought has singled out, in each epoch, different models of science, dependent on the dominant philosophical assumptions⁵⁶. In more recent times, a much more substantial dependence has been demonstrated from economic, political and military powers, financing with "work orders" and imposing decisive choices of orientation, goals, and often as well methods. Everything in science can become conditioned and even manipulated in favour of these interests. It is enough to think of the periodical "*scientific demonstrations*" of the harmfulness or harmlessness of certain products. Instrumental well-orchestrated sales campaigns or even unfair trade competition are well known "*models*" of how strongly researchers' mentality and behaviour can be influenced⁵⁷.

About mentality a historical example, very naive indeed if compared with those of today, can explain a lot. *Mechanism*, conditioned the first researchers who, fascinated by the mechanical robots, conceived the universe as a simple machine. They thought that knowing all its pieces and the laws of its functioning, all the rest could easily be foreseen and determined. It was within this conceptual model that the well known definition of God as a "*useless hypothesis*" matured and later became a spearhead for anti-religious propaganda for a long time⁵⁸. Such a conception was possible only because of the frightful immaturity and naivety which influenced the scientific model of the universe at that time. Both philosophers and scientists proved to be completely unaware of the tremendous complexity of every infinitesimal sector of reality. Moreover, such vision proved to be repressive and oppressive, not only in relation to philosophy, metaphysics, religion and theology, but to science itself.

All that strayed even minimally from the mechanistic paradigm was inexorably repressed in the name of science. Science and the ideology of mechanism were one. This vision represented the spearhead of anti-religious and atheistic materialism, which, however, in its successive version, the dialectic one, branded the preceding one as rough and coarse ideology⁵⁹. It is very interesting to note that from the same roots of negation of the "*Creator*" came the negation of the "*creativity*" of science. Both good and bad philosophies, as well as ideologies of any kind, therefore, can enter - sometimes in a very complex tangle - into the unproved and unprovable assumptions of the sciences. Moreover, the most different kinds of metaphysics - monistic or pluralistic, materialistic or spiritualistic, subjectivistic-idealistic or objectivistic - closely condition the development of the different scientific models⁶⁰. Neutrality does not exist in facts and theories neither in philosophic

and scientific assumptions, nor in research programmes, more and more steered by interests foreign to the "purity" of research but not to the logic of power and of profit⁶¹.

Weakness, partiality and uncertainty of science

Thus the picture of science emerging in this paragraph is completely different from that presented in the "first approach", the weakness of which seems to lie in its naive and a bit out-of-date conception of science. Nobody can deny that science is an advanced and prestigious form of research, but neither can one avoid mentioning all these points of weakness: limits, ambiguity, errors, biased concepts. All these "weak points" make of it a type of knowledge that is also partial, provisional, temporary, conjectural, not neutral, full of unverifiable assumptions, subject to all the pressures of interest and power and to every ideological influence. However we cannot do without it. The only chance we have is that of trying to make it less imperfect, without any illusion of great or definitive success. Science shows itself as an unprivileged form of knowledge, incapable of surrogating the others. It is *indispensable* and *insufficient* like the others. It needs epistemology, philosophy, metaphysics, ethics, religion, faith and theology, as all of these need it.

Consequently, *no exclusive and privileged relationship between science and faith can exist separate from all the rest*. All these considerations demonstrate the necessity of a dialogue and confrontation involving an extensive trans-meta-interdisciplinary relationship - as extensive as possible - *taking place in conditions of absolute equality among all scientific disciplines, the history of science and of scientific thought, methodology, epistemology, the various philosophic systems, ethic, religion and theology*. Only by a common effort will it be possible to put every scientific proposition back into its appropriate methodological, linguistic, paradigmatic, historical and cultural context. Only in this way will scientific propositions be liberated from all ideological influences, decoded in their symbolic value and apprehended in their heuristic implications. Only after all this work can a second step be taken: *the analysis of the cultural and human sense of scientific discoveries in order to enucleate their ethical values and their religious and theological meanings*.

Only at the cost of *this tiring elaboration can the human, humanistic, philosophical, ethical, religious and theological contents implicit in any research - or involved in and brought about by it - acquire clarity, correctness and depth*. Thus it becomes possible to deliver the "scientific product" from its more improper and undue uses, from the opportunistic and factious interpretations dictated by partial interests, and from the improvised phantasmagorias of the various amateurs or thought-adventurers. By the last expression I mean anyone who, however knowledgeable in his own field, assumes alleged competence in other fields in which he hardly knows anything. As this method, and the respective structures of such trans-disciplinary confrontation and dialogue do not exist, it is necessary to act urgently and establish them, in an atmosphere of utmost respect and mutual acceptance, accompanied by the greatest critical rigour. Such faith-science-culture relationship would also be an occasion for powerful renewal in the present-day phase of stagnation of thought.

Human sciences and religion

The examination carried out up till now shows a confrontation mostly centred on natural sciences. Nowadays, on the contrary, human sciences - both because of their significant contribution to the epistemological debate and their specific field of research - seem to provide elements of greater importance in relation to religious and theological themes. The notable uncertainty which reigns in these disciplines should not be hidden, with reference to the spheres of investigation involving their very denominations - human, social, behavioural sciences - and to their fundamental epistemological statute⁶². It is, however, just these uncertainties which cause elements of remarkable heuristic, epistemological and methodological value to enter into the general debate on science, as it seems, for example, in the case of objectivity and neutrality. This provokes cultural vivacity. In the sociological field, for instance, T.F. O'Dea, P.L. Berger, and L. Luckmann have formulated some problems of religiousness in different and creative ways.

According to O'Dea, to correctly define the relations between religion, structures and social processes means, among other interesting things, to ensure a better understanding of man's activity, thought, behaviour, feelings and culture. Therefore, "*to understand religion is to understand also man and society*"⁶³. In Berger's opinion, it is decisive not to lose sight of the transcendence in human culture and life, as an antidote to the radical banalization toward which culture and secular society are inevitably heading. Religion offers, in particular, a precious and invaluable "*evaluation of reality from a perspective which transcends time*"⁶⁴. In Luckmann opinion, finally, religion is particularly interesting as a means to verify the emergence of the human and social conscience through which man realizes his "*transcendence of biological nature*" and society develops in its "*universal fundamental processes*"⁶⁵. These scientific researches need methodological tools and conceptual criteria more clearly defined and less restricted than the current ones. The epistemological difficulties to overcome in this sphere are far greater than the typical ones of natural sciences.

Consequently, they can anticipate methodological and epistemological openings more interesting than those offered by natural sciences. Just as full of provocation and stimulus is the field of the psychological sciences on religion, which, even though unable to measure up to the transcendence - as it exceeds their methodological territory - do not overlook the importance of transcendence as a cultural subject, for which to find more proper criteria⁶⁶. Neither to be neglected is the method for studying religion and Christianity in the light of Mircea Eliade's and Cazeneuve's comparative psychology of religion or Bovet's, Clavier's Deconchy's and Goldman's religious genetic psychology⁶⁷. Some researches follow different orientations such as: a) the investigations of the psycho-social factors which condition the development, cultural manifestations and vitality of Christianity in comparison with other religious cultures; b) the study of the psycho-social factors, starting from psychic mechanism and negatives influences, which condition the motivations and the expressions of religious life in children adolescents and adults.

A brief summary of the "second approach"

In these projects we still find numerous traces of the old scientific assumptions, in contrast with some new trends of sociologists who, as we have seen in the aforementioned authors, have shown more courage, creativity and originality in their new working hypotheses. Anyway it is important that scientific attention to the religious phenomenon is looking for new leads and bringing about a greater consciousness of the limits of such researches. This would make it possible to distinguish between genuine religious manifestations or otherwise, from a sociological and psychological point of view, in order to initiate more original and critical hypotheses⁶⁸. The delicacy of the problems requires great methodological and epistemological rigour and represents an interesting point of debate.

We are by now a long way from the old affirmation of "*insignificance*" attributed to religious subjects⁶⁹. All of this give rise to interesting problems for the believer. In fact, while formerly religiousness tended to locate the privileged position of the meeting between God and man in the sphere of natural phenomena (*cosmocentrica*), now Christian faith and theological thought have realized that the more appropriate meeting place is the awareness of critical conscience of man himself (*anthropocentrism*). In this way the human sciences and the science of religion progressively extend their sphere of research, repositing in new terms the classic themes of religiousness and of the Christian faith itself, such as the images of God "*per sé*" and in his fundamental attributes (love, paternity, providence, etc.), the theme of "*signs*" (sacraments and miracles) and, finally, the internal-cultural and external-ritual behaviour of man and of the community⁷⁰.

After an initial disorientation, believers discover the great value of these researches for a verification of religious experience, both in its most varied sociocultural manifestations and in its personal expressions. Pedagogical sciences too offer a notable contribution: "*since the aim of pedagogic activity is to give to those who are being taught access to all forms of learning, knowledge and behaviour, as a basic condition for them to live in an autonomous and critical way,*

it must be open to all human activities and to their progressive verification". Consequently, it must also be open to that fundamental activity which is religion and to its thematic reflection, i.e. theology⁷¹. Only in this way can the reflective principle be formulated on the basis of which the individual subject can develop constructively and consciously at every moment and in whatever condition or situation he may find himself. The field of confrontation which is opened up, in this sense, appears to be of the greatest scientific and formative topical interest.

Confrontation on the behaviour of researchers

This approach differs from the preceding ones because it shifts from contents and methods of science to the personal behaviour of researchers. In it the "*religious man*" (*Homo religiosus*), that is the believer is considered in comparison with the "*scientific man*" (*Homo scientificus*), that is the researcher. We will see the reason why. The first two approaches were more developed in western European culture whereas this third one is more developed in Anglo-American culture. It is divided into two main branches: a) the comparison between the behaviour of scientific researchers and that of believers⁷²; b) the analysis of the human and humanistic behaviour necessary to scientific research⁷³.

Comparing the attitudes of researchers and of believers

This very interesting research is not much known in European culture. It is worth examining. It starts from the presupposition that the science-faith relationship involves realities much vaster than words or concepts and cannot be reduced to comparing this or that scientific discovery with one or another religious truth. What counts is the "*basic behaviour of the person*". The real problem is that the "*scientific man*" thinks he must be in total conflict with the "*religious man*". Even the philosophies and ideologies of the past have influenced not only so much the ideas or the merely conceptual aspects of the problem but also the human behaviour of researchers and of men of the scientific era⁷⁴. This is clearly demonstrated by the success and consensus gained by such widely accepted positions as the *atheistic naturalism* of T.H. Huxley, the *evolutionary agnosticism* of H. Spencer and the *atomistic materialism* of E. Haeckel, etc, in spite of their naive reasons and very weak demonstrations.

The conflict was nurtured by the degraded "*theistic*" conceptions of God and of the religious data then dominant in philosophic and religious culture. To speak of science-faith conflicts, appears, therefore very reducing and improper. The phrase changes from being ambiguous to incorrect, if one forgets that the conflicts were then, above all, between some theologies, from one side and some scientific theories and philosophies of science from the other. We could also say: between some theologians and some researchers. All conflicts were situated only at the level of *secondary conceptualizations* or, if we prefer, *contingent cultural interpretations* of religious faith and reality⁷⁵.

Religion and the scientific image of the world

In fact, faith is conveyed by and expressed through a cultural-theological support, while scientific data are conveyed by a historical-cultural mediation. Complex linguistic, historical, symbolic and cultural mediating factors are at work in both, as we have already seen. Only in more recent times have we acknowledged the distinctions between reality and its linguistic covering, between the religious datum and the conception of the world, between the expression of faith and its cultural mediation, and so forth⁷⁶. Such distinctions, which had been adopted in theological reflection from very ancient time, and forgotten by the most at the time of Galilei, are beginning now to operate also in the scientific sphere, revealing unparalleled validity. As far as the human behaviour of researchers is concerned, we can make use of the researches of Hanson, Kuhn, Coulson, Schilling, McMullin, and, above all Gilkey, Toulmin and Barbour who have brought to light the intimate union and inextricable intermingling of operations only theoretically distinguishable⁷⁷.

The "*personal influence on knowledge*", according to Polanyi, is very important because judgement represents one of the most personal acts, the foundations and mechanisms of which are never decipherable with total certainty or through universal and absolute criteria⁷⁸. According to Berkhof, the scientific image of the world, which represents the universe as a great dynamic event in expansion and evolution - the order of which is mostly of an emerging type - confers incomparable greatness to the idea of creation and increases the dignity of the Creator, freed from the worn-out and ambiguous representations of the God-demiurge, or God-watchmaker. Instead, it strengthens the mighty greatness of the God-transcendent⁷⁹. Thus, if a religiousness which feeds itself on old pre-scientific images is punctuated by nowadays unanswerable questions, and appears to be rather petty, the religious attitude which springs from the grand complex of images of the world, and from the questions which originate from it, releases greater vitality and is much more valid. In such a context, the experience of scientific research, with its inexhaustible self-interrogation, represents not only a beneficial provocation, but also a model for a religious attitude always aiming at the best and the most⁸⁰.

Science unprovable presuppositions

Besides, it offers continual opportunities of being purified from the contingent false images conditioning any human, social, cultural and scientific conception. This implies a faith and a religiousness more and more critical and dynamic. Science, with its repeated "*novelty shocks*", calls for profound rethinking capable of enlarging, deepening, enriching and renewing our personal representations always narrow-minded and inadequate of God and his world. As a matter of fact, if we reflect on this aspect, we realize that the most profound realities and their most authentic and significant representations are not questioned here, but their out-of-date linguistic expressions, their culturally obsolete images, the frail and always contingent vision of the world by which they were framed, the ambiguous and limited pre-conceptions of man and of the cosmos which conveyed them are under dispute. A centuries' old history can confirm all this⁸¹. It is important to consider that after three centuries of very close debate, not one of the fundamental truths of the Christian faith has been substantially undermined. On the other hand, religiosity in general and the Christian message in particular, as a whole, appear to be more alive than ever.

Coulson notes, in particular, that the three reasons used to demonstrate the superiority of science over religion have proved to be unfounded⁸². In fact these three advantages were attributed to science: a) it does not start from unverified presuppositions; b) it is based on indisputable pure facts; c) it is based on impersonal, irreversible and inalterable laws. As seen before, none of the three points have survived to the epistemological criticism of the last century. It has been proved instead, that: a) science is based on a mass of presuppositions in part unprovable by it and in part unproved at all; b) pure facts never existed because all data always are a complex system of facts and interpretations; c) scientific laws are conjectural, more apt to be falsified than verified and can be interpreted in various ways according to the different theoretical and cultural contexts of interpretation.

What is worse is that *scientific models* cannot avoid the dramatic dilemma of being either "*over-defined*", which causes increasing inconsistencies, or "*under-defined*" and therefore subject to wide margins of imprecision and indeterminacy. Consequently, the scientific researcher must use his personal talents wisely and sharpen his ingenuity and creativity to steer clear of trouble in difficult and never totally satisfactory conditions.

Analogies in the behaviour of researchers and believers

Schilling has highlighted the profound analogies of behaviour and method adopted by researchers and believers. Both have to face moments of experience (*empirical*), of reflection (*theoretical*) and of action (*transformative*). Here the difference is all in favour of religious behaviour which involves the extreme resources of a person more deeply and vitally than in scientific research⁸³. Experience and reflection in both cases remain profoundly intersected. Both of them set a limit to their own field. Religion concentrates on the definitive and supreme

questions, on the fundamental values of existence, on the ultimate identity and final destiny of man. Therefore, religion covers all fields of human knowledge and in this way it needs to be integrated. In both, religious and scientific attitudes, experience, reflection and action are never completely separable. In both, "*inter-subjective*" verifications between the individuals and communities are essential.

Also the similarity of common basic attitudes of researchers and believers should be underlined: they both come up against something "*unknown*" which transcends them. Both of them question the "*unknown*" without knowing the answers beforehand and must adapt themselves to the ones which they receive and which judge them. Both are wrestling with a "*mystery*" of which they long to lift at last an edge; both learn by their own mistakes, and participate, share and verify their experience together. They both live continually suspended between success and failure, and must explain the "*inexpressible*" by using images, symbols, models which cannot be confused with reality. Also at the base of research, a human faith operates implicitly: a faith in something that exists, that can be approached and at least partially apprehended, something inexhaustible and worth discovering. Researchers and believers are convinced that their efforts have a sense and that it is worth making sacrifices.

This review of the analogies between researchers and believers highlights all the best qualities for which man is truly man and develops his authentic humanity. Therefore, these two great human experiences, with all the spiritual attitudes and behaviour they involve, are anything but distant and foreign to each other and have much to exchange and to offer each other. What is positive or constructive for the one can also be for the other, and the same can be said of what is negative or destructive. Both of them have to do with a truth which transcends the persons of the researchers and their formulations. In both, an *ethic of truth* is implicit and operant. Taking into account such facts, it follows that any possible conflict, if dealt with properly, is all but negative, and could lead up to a common growth and to the surfacing of new modes of understanding and knowing reality which could be shared and exploited⁸⁴. If, as some assert, science *frees us from the illusion that the world and reality are as we like to imagine them and teaches us how to use our errors positively*, it can be very helpful to improve our religious and ethical attitudes and our faith.

To free ourselves, day by day, from the slavery of our illusions and projections, better to attain reality, is in any case a valid aspiration. It can be equally freeing and creative to discover unexpected sides of reality, traces, remains and clues, which enable us to perceive God in new ways, not in the distorting mirrors of our illusions or ignorance, but by continually-renewed approaches to reality such as in scientific knowledge. The Copernican and Galilean revolutions, evolutionism, relativity, indeterminism, psychoanalysis, molecular biology, notwithstanding their limits and errors, have offered important occasion for the renewal of our faith and religiousness. In many ways they have helped believers to knock down inconsistent images, spurious interpretations and cultural insinuations, surreptitious in their beliefs. They have proved to be an excellent reagent for the defective and languishing faith of many believers, and they have caused the fundamental problems of creation, of human freedom, and of the historical responsibility and duties of the Christian conscience to be presented in new and more adequate ways⁸⁵.

Scientific discoveries and religious renewal

The benefits would have been greater and damage less if the confrontation had occurred in a larger context of epistemological and methodical analysis, and a more correct, serene and rigorous discussion, instead of giving in, on the one side, to unjustified triumphing and thoughtless iconoclasm, and, on the other, to frightened panic. These attitudes, and not faith and science, gave rise to bitter polemics and ambiguous concords. This experience could be precious to learn, from both sides, how to make the most of the many instruments at the disposal of researchers and believers, in order to proceed towards a common and constructive confrontation, which must be trans- and inter-disciplinary today. It could be useful to remember here what I wrote on this matter in my: "*Critica ed etica nella ricerca scientifica*":

"Reduced to its extreme components, the experience of scientific research is the experience of the self-affirmation of the rational conscience of the researcher, of his recognising himself as a knower truthful in his judgement, and, at the same time, is the insuppressibly affirmation of a world which transcends the researcher and imposes its presence on him. Therefore, his self-affirmation is also acceptance of that which transcends and surpasses his person and his convictions, dominates him, with an absolute need of coherence, reasonableness and verification, and imposes on him"⁸⁶.

Put in this way, the confrontation between the two great "*vocations*" of man - the scientific and the religious one - appears as being particularly creative and fertile. So that it is more important than ever, today, to make the most of the creative instance inherent in religiousness and of the religious moment typical of scientific research, if we want to save both from the danger of being subjected to the pressures of the interests and of the powers operating in present-day society. We must not forget, in particular, the orientations traditionally imposed on science by political, economic and military powers which, emphasizing only its technological and operative results, have reduced it to being an instrumental agent in the hands of the dominant powers, the alien executor of their hegemonic projects and a slave to their partial interests. This perverted and unnerved science has not only degraded itself, but has become a docile and powerful instrument causing the degradation of the environment (*ecology*), of man (*manipulation*) and of society (*oppression and repression*). These principal damages have not affected so much religion and faith, but first of all science itself, and above all man, society, culture and the environment. It is against this degradation that an alert religious and Christian conscience must keep close watch.

A brief summary of the "third approach"

Now we can formulate a brief, conclusive summary also of this third approach: 1) Science is, above all, a profoundly human activity which can express man's best attitudes, such as passion and dedication to truth, also typical and insuppressibly in any genuine religious experience. 2) Scientific activity can be a source of intense religiousness, understood as man's continual self-questioning under new aspects, and in deeper and deeper ways, about ever-growing problems. Yet religiousness distinguishes itself for its deeper personal involvement in the decisive themes of the significance of personal existence, the fundamental being, destiny and becoming of man and his absolute future, which, defined as "*questions of ultimacy*" constitute its specific contents. 3) Scientific acquisitions help the believer to verify his own faith constantly. The new images of the universe, of man, of society and of history challenge the former formulations of the truths of faith, and of religious and ethical values. In this way it becomes possible to purify faith and religion from arbitrary insertions, conceptual misunderstandings and an inadequate, fanciful or superstitious imagery.

Any conflict, if properly dealt with, provide corrections of great heuristic and hermeneutical value. Purification, however, must be twofold and work in both directions: freeing religiousness from undue prescientific representations, and releasing science from undue encroachments, arbitrary interpretations, and metaphysic or pseudo-religious extrapolations. 4) The profound similarities do not annul, however, the radical difference which consolidate, for each of them, an essential role and preserve their specific identities. Science will always remain orientated towards the empirical knowledge of limited and specialized spheres and bound by the logic of naturalistic interpretation. Religion will move in the sphere of ultimate all-inclusive realities, of the profound and definitive problems of human existence, of the total and absolute transcendence, and of the personal encounter with "*Somebody*" (and not towards the impersonal knowledge of something).

The Christian faith adds to this religious aspect the proclamation of a "*Someone*" who involves himself, from nearby, with the existence of man and with his ultimate and definitive aspirations, a "*Someone*" who is not a generic impersonal transcendence, but the only absolute personal Transcendent, who reveals his name and his face, constructs with man an itinerary of freedom, salvation and redemption, forms and keeps an alliance, reveals and gives himself, takes on human features, and in Christ becomes human flesh. Thus, the confrontation between the two

experiences and the relative attitudes and contents allows a vital exchange, which is to be accomplished with rigorous respect for the respective spheres, methods and contents, without any intrusions or imperialistic and hegemonic pretences, without any misunderstandings or confusions, but with attention and sympathy. There are no alternatives to this relationship, or better, some do exist, but they are the well-known ones which always end up, depending on the cases, by transforming science into pseudo-religion or religion into pseudo-science.

Scientific humanism

The further aspect of the analysis of the human behaviour of researchers is clearly described by E. Cantore's "*Scientific Humanism*". His starting point is more or less similar to the preceding one. Procedures and goals, however, are different, because they focus on the humanistic aspects of science. Then "Scientific humanism is the humanism that should result from the harmonious integration of traditional humanistic concerns and the new insights brought to light by science"⁸⁷. It derives from an "*experiential-reflective*" attitude aiming to underline the human depth of the scientific experience of researchers to make them aware of what they do, and to help them rediscover the human basis of their scientific behaviour in a correct way. It combines creativity, open-mindedness in front of reality, cognitive experience and the intimate conviction of perceiving something true.

Another path to humanization derives from the way in which scientists read and interpret reality: the universe as harmony, a great design, an all-inclusive structure penetrable by the human mind. The sum of these two experiences, the subjective one of knowledge and the objective one of nature, is part of the tight web of the others, that is to say the sense of profoundness, of the ultimate, etc., already examined. However, this would not bring the researcher directly to a religious attitude, but would only constitute its fundamental premises. From an epistemological point of view, scientific knowledge proves to be not intuition but experience, not rationality but intelligence, not possession but open-mindedness and service. With respect to the more specifically religious problems, this way differs from the other followed by Gilkey, Barbour, McMullin, Coulson, etc. Scientific humanism thinks that it is not correct to pose the problem of God directly, but prefers to focus its discourse on the Absolute.

To avoid any confusion, however, it establishes some epistemological conditions very important for a correct dialogue from the point of view of both the scientist and the philosopher. Consequently, a confrontation on the Absolute, moving from a scientific experience, requires that: 1) The specific contribution of the science to the problem be respected. 2) All kinds of undue mysticism, lying outside the scientific field, be avoided. 3) The solutions proposed at a reflective (*philosophical*) level be verified. 4) The indicative, rather than demonstrative, character of the solutions be taken into account. 5) The analogical significance of language never be forgotten⁸⁸. Under these conditions the scientifically aware man has no need to withdraw or to avoid expressing himself on the decisive problems of the significance of reality in its authentic source⁸⁹.

Science and ethics

These fundamental human themes can thus be expressed in terms that are most correct and unexceptionable even for the most demanding man of science. Under certain aspects, this position is similar to Borghi's; however, while the latter's preoccupation was principally intellectual - to solve the problems posed by science and unsolvable by it - scientific humanism is more specifically human and ethical. Its main concern is how to overcome the process of dehumanization brought about by the overwhelming problematization of the sciences. In this way it further enlarges the sphere of the traditional confrontation between science and faith, adding a new aspect to it: *the ethical problems raised by research*. Before dwelling on the applications and the problems in detail, we have to be sure that the foundations are well laid. Scientific humanism underlines, therefore, that science with all its discoveries, is a source of "*self-discovery for man*".

Besides, as man is always discovering new truths which are relevant to him, and sees reality in ever-renewed ways, he finds in science also a source of "*self-understanding*" and "*self-*

awareness". It is therefore right to affirm that science has conducted man to a new self-awareness and self-consciousness. In such a sense, science proves to be not only humanistic but also human and strongly ethical because, besides making man capable of becoming more aware and conscious, it does not allow him any self-complacency, pushing him to transcend himself incessantly. Such transcendence involves research itself and the methods of science, which remain authentic only in the proportion in which they develop the potentiality of the spirit that gave them life and keeps them still alive. Scientific humanism has further developed these observations, directing them towards a commitment in defence of the dignity of man and of the integral development of all peoples.

In fact, granted that the problems raised by science are above all ethical and human, a fundamental ambiguity follows: "*raised by science*" does not also mean "*solvable by science*", but just the opposite, because the cognitive autonomy of research has shown itself to be a double-edged weapon and the incessant expansion of new acquisitions has made any attempt at a synthesis impossible. Consequently, the fundamental ethical values, criticized and shaken by science, have not found in science any instrument able to replace them. The very same technological progress inspired by science has taken the most material forms, causing harmful productional and consumerist attitudes. The present crisis is very significant in this connection. Thus science has become one of the prime factors of confusion, scepticism, and fragmentation, and not of human union and cultural unity. The conviction that science is incompatible with morals and religion is especially due to this fact. This has impeded, in the scientific era, both the attribution of adequate significance to existence, and a consensus and general commitment for the good of all.

Dignity of man and integral development of humanity

The excessive emphasis on outward appearances and material achievements has produced a degrading of culture and of human attitudes. On the contrary, the immense cultural, human and operative potential of research has not been even minimally exploited. Science has contributed very little to the wisdom and maturity of man. The basic problem is, therefore, to make it capable of contributing to the growth of man's dignity and to his authentic development. For this reason, scientific humanism increasingly stresses ethical fundamentals and results. The dignity of man and the integral development of humanity are the bases for the most serious and actual moral obligations.

We could enumerate the following: 1) Researchers must publicly acknowledge their own individual and collective responsibilities with regard to man's dignity and development. 2) In view of these two goals, they must increasingly develop their specific professional skills. 3) The development and protection of man's dignity must become the end underlying every single particular goal. 4) Scientific workers must, in particular, defend, protect, and increase the actual and potential resource of nature. 5) Researchers must also do their best in order that such resources can be equitably distributed and used by mankind; scientists must also promote a common sensibility to the problems of man's dignity and development. 6) Apart from their personal commitment these manifold responsibilities are simply the corollary of that "*concreative joint responsibility*" which concerns all technical-scientific commitment.

Scientific humanism describes also a series of positive suggestions to implement and negative options to avoid. Let us start from the latter: 1) The scientific profession should not be entered into or pursued for the sake of money, power or personal prestige. 2) No research should be initiated unless its negative potentialities for the development of human dignity have been thoroughly examined beforehand. 3) Scientists should not entrust totally to others the control and the use of their discoveries. 4) Researchers should not work for the advantage of certain groups to the detriment and prejudice of the dignity, freedom and development of other persons and communities. 5) It is the duty of researchers to find solutions safeguarding the poorer and weaker persons and groups. 6) Researchers should not overrate or undervalue the human significance of their profession.

Then the positive suggestions: 1) Scientists should become aware of the potentialities for the development and protection of human dignity inherent in their spheres of research. 2) They should give the preference to the fields of research which offer the greatest contribution to the development of peoples and to the dignity of man. 3) They should acquire a greater understanding of the obligations of moral development incumbent on their professional commitment and make them the directing criteria for their own behaviour. 4) They should help each researcher and community of research to grow towards moral maturity. 5) They should create, in their own professional spheres, a conscience and a commitment favourable to the development and protection of human dignity. 6) They should support publicly, through various initiatives, the themes of man's dignity and development according to the problems which arise in their own fields of competence. 7) They should create sensibility to and consensus on these problems. 8) They should devote special attention to young people until they are properly prepared for and introduced to these realities. 9) They should defend these requirements with no fear of facing misunderstandings or professional difficulties and socioeconomic disadvantages⁹⁰.

It is clear that scientific humanism introduces a strong ethical tension into scientific life and problems. It supports the sense of responsibility of scientist toward their work and the great needs of today's society. This aspect, until now quite absent from the science-faith debate, should assume a predominant role in Christian ethic, in harmony with the renewed interest in praxis of today's culture and of Vatican Council II.

Christian faith in the science-religion confrontation

We have now at our disposal a survey of themes on science very useful to give a correct basis to the current science-faith dialogue. We must, however, also deal with the second "*partner*" of the dialogue: faith. Renewal in this field has been much greater. Theology, that is the critical and historical-systematical reflection on faith, has investigated the hermeneutic theme in depth for a long time. Its decisive step consisted in re-discovering the sense and the value of the history of salvation as the foundation of Christian faith. This has brought the discussion, and all its relative problems, back into its right perspective. History of salvation means that faith has at the centre of its concern and horizons the saving action of God toward mankind. Faith is a re-reading of human events in the light of the history of salvation.

Its logic of reading and its interpretative viewpoint remain, therefore, specific in that sense, and cannot deviate from it, nor be substituted. Thus, the occasion for irremediable clashes with any other cultural force cease to exist. In the biblical-theological field, the discovery of the rigorous distinction between contents and modes of expression, languages, literary genres, etc., has greatly helped to reduce the possibility of grave misunderstandings and insuperable conflicts. Nowadays nobody can pretend to compare the biblical language and imagery with those of science directly, without being disqualified culturally and theologically. This operation would be considered a naive amateurism and cause of a seriously faulty knowledge. Another fundamental theological acquisition was the growing awareness that linguistic expressions of faith can never keep completely to some formulations of the past under danger of their debasement to ideological expressions.

Christian faith, however, is not an ideology but a message open to all cultural provocations, open to the confrontation with all cultures and capable of facing all new emerging realities, even if it seems that, at first, they cannot be converted to the Gospel and transformed by the Spirit. What still stands true, however, is the permanence of faith as the salvation of the world and of history in an inexhaustible variety of forms. This also implies the duty and the possibility of creating new expressive modes to propose God's authentic summons to men in any epoch and culture, without devaluing any of his past concrete incarnations and without sticking to any of them⁹¹. Theology, moreover, has the fundamental task of freeing faith from any exasperated intellectualistic reductionism in order to give it back all its vital depth and existential dimension. Thus, faith reveals its identity and role of man's total answer to God revealing himself in Christ. Divine

revelation appears again in all its complexity and multiplicity of aspects: person, action, event, history, word, message, meeting, communion, etc.

Consequently revelation and faith are extremely articulate realities, implying manifold dimensions, such as the knowledge of a saving event, trust in God, opening to his word, loving acceptance of him, free and responsible answer to the Father, communion of life with Christ, the Son, and commitment to the Spirit. Faith inserts believers totally in the history of their time as well as in the history of all mankind through the fullness of an history of salvation, in which the believer is called to work not as a mere onlooker, but as a protagonist who throws in it all the weight of his sensibility, intelligence and humanity. In such a context, the human experience of scientific research acquires a great value, and becomes a positive and irreplaceable factor. Then, the unavoidable conflicts and provocations arising from the daily impact between faith and world, are everything but a mere contradiction between statements taken either from the Bible or from scientific handbooks. Therefore, any science-faith conflict and confrontation must be considered as a dynamic events of great cultural, historical and saving importance and dealt with in a renewed personal, historical, cultural, and social dimension.

Final remarks

We have examined a wide review of the modes and formulations of the science-religion-faith debate and relationship today. On the one hand, we have pointed out the great changes which have taken place both in the *thought of the sciences* and, above all, in the *thought on the sciences*. Other important achievements are to be found in philosophy, epistemology, methodology, the history of scientific disciplines. In consequence of them scientific reality appears in a totally new light. Even if many of these acquisitions are still undergoing lively disputes, the scientific dogmatism, positivism, and materialistic ideologies, which conditioned science so deeply in the past, appear definitively overcome. Today's situation could be summed up approximately in this way:

1) A direct confrontation between science, religion and faith seems to be possible only according to the situations underlined in the first approach: a) questions raised irrevocably by the sciences and unsolvable by them; b) insurmountable difficulties springing from the heart of scientific research and requiring an attitude more comprehensive than that allowed by the narrow principles, methods and criteria of natural and human sciences. 2) These problems require a systematic confrontation and a much more advanced methodological and epistemological reflection. This introduces to the second approach to the science-religion-faith dialogue. This approach has brought to light a scientific reality totally different from the traditional past in which the science-faith conflict thrived.

The new image of present-day science is conjectural, hypothetical, falsifiable, temporary, provisional and partial or even unilateral, subject to conditioning of every type, dependent on innumerable unproved and unprovable presuppositions. This situation has not been used properly in the science-faith confrontation, yet it could reverse the ways of the old debate. The major problem for the believer and, above all, for the theologians becomes that of deciding what use to make of scientific data in these new conditions. The most reliable and realistic proposal, even if difficult to put into practice, is that of starting a regular trans- and inter-disciplinary dialogue between all cultural components involved in "*scientific culture*" according to proper and rigorous procedures. 3) There is a third approach to the problem, centred on the human attitudes of both researchers and believers, which sheds light on many elements of the profound behaviour of both and, because of this, could allow fertile comparisons and verifications.

Dialogue faith, religion, science, ethics

4) Finally we have considered the new approach of scientific humanism underlining the ethic and moral aspects of scientific research and opening a field of confrontation focused on the responsibility of scientists in the contemporary world. Scientific humanism does not consider only

the intellectual and heuristic consequences of research, but also its implications on human dignity and the development of peoples. It privileges them in order to overcome the pure intellectual aspect of the preceding disputes and to make scientists conscious of the basic social and cultural problems of human coexistence. In this way the whole problem is led towards very concrete and constructive goals concerning mankind. A scientific thought more aware of its limits and responsibilities and a faith more attentive to the great problems of human and social coexistence, seem to be more reliable partners in a renewed confrontation.

Besides, the conceptual and cultural instruments at the disposal of both are today much more refined and efficient than in the past. It appears evident now that every conflict brings to light incorrect or improper positions of one or both sides. The consequence cannot be the rejection of faith or of science, but a common effort towards more critical investigations, more correct formulations and more rigorous linguistic expressions. Conflicts, therefore, are not to be feared but to be accepted as occasions: a) for a serene trans- and inter- disciplinary confrontation bringing important cultural implications; b) for finding more effective methodological and epistemological criteria. Once faced in this way, they can be an occasion of cultural growth for all: scientists, philosophers and theologians. This should encourage extension of the dialogue to the more urgent human and social problems of our time.

This dialogue, although possible, appears very demanding. However, we must not be discouraged but ready to save the human and moral values of science and their potential use for the service of man, culture and society. Such service assumes more and more the aspect of defence of the dignity of man and of the development of peoples. New objective conditions make possible the passage from a state of conflict or indifference to one of constructive collaboration. For a better life in a better world, faith, religion and science can and must work together with courage and humility.

¹ This is the text of the lecture given at the "International Symposium on Scientific and Religious Knowledge - Novosibirsk Academytown, December, 10-15 1990". (Courtesy of the Rector of the Novosibirsk State University Prof. Y.L. Ershow).

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⁵ One of the best Institutes for such approach is: ITEST (**Institute for Theological Encounter with Science and Technology**) Director Prof. Robert Brungs s.j. (a biologist, philosopher and theologian) 221 North Grand Boulevard - St. Louis, Mo 63103, USA. Some of his most recent works are: *You See Lights Breaking Upon Us. Doctrinal Perspectives on Biological Advance*, (St. Louis 1989) and *Science/Technology Education in Church-Related Colleges and Universities*, (St. Louis 1990).

⁶ One of the best structures for this approach is the WISH (**World Institute for Scientific Humanism**) Director Prof. Enrico Cantore s.j. (a physicist, philosopher and theologian) Lowenstein Center at Fordham University, New York, 10023, USA. Cantore has written among others: *Scientific Man. The Humanistic Significance of Science*, (New York, 1977).

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